

# COURSE SYLLABUS

<b>LAST REVIEW</b>	Fall 2021
<b>COURSE TITLE</b>	Calculus and Analytic Geometry I
<b>COURSE NUMBER</b>	MATH 0122
<b>DIVISION</b>	Math, Science, Business & Technology
<b>DEPARTMENT</b>	Mathematics
<b>CIP CODE</b>	24.0101
<b>CREDIT HOURS</b>	5
<b>CONTACT HOURS/WEEK</b>	Class: 5
<b>PREREQUISITES</b>	MATH0105/106 College Algebra (w/wo review) and MATH0112 Trigonometry <b>or</b> MATH0108 Pre-Calculus Mathematics with a grade of "C" or better.

**COURSE PLACEMENT** None

## COURSE DESCRIPTION

Calculus I is designed for students in mathematics, hard sciences, and engineering. Content includes limits and their properties, differentiation and its applications, integration, and calculus of exponential and logarithmic functions. Students will be expected to use appropriate technology as one tool to achieve competency in Calculus I.

## GENERAL EDUCATION LEARNING OUTCOME

- Basic Skills for Communication
- Mathematics
- Humanities
- Natural and Physical Sciences
- Social and Behavioral Sciences

## INSTITUTIONAL LEARNING OUTCOMES

- Communication
- Computation and Financial Literacy
- Critical Reasoning
- Technology and Information Literacy
- Community and Civic Responsibility
- Personal and Interpersonal Skills

## TEXTBOOKS

<http://kckccbookstore.com/>

## **METHODS OF INSTRUCTION**

A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

## **COURSE OUTLINE**

- I. Limits
  - A. Point
  - B. Infinity
  - C. Continuity
  - D. Intermediate-Value Theorem
  - E. Differentiability
  - F. Derivative of a function
  
- II. Differentiation
  - A. Powers, exponents, and sums
  - B. Products and quotients
  - C. Chain rule
  - D. Exponential, logarithmic, and trigonometric functions
  - E. Hyperbolic and inverse trigonometric functions
  - F. Implicit differentiation
  - G. Velocity, acceleration, and other rates of change.
  - H. Equation of a line
  
- III. Applications of Differentiation
  - A. Critical points
  - B. Mean –Value Theorem
  - C. Behavior
  - D. Inflection points
  - E. Concavity
  - F. Sketch graphs
  - G. Interpret graphs\
  - H. Optimization techniques and related rate problems
  - I. Newton’s Method
  - J. Change
  
- IV. Integrals
  - A. Riemann sums and integrals
  - B. Limit of Riemann sum
  - C. Definite Integrals
  - D. Algebraic, exponential, and trigonometric functions

- E. Fundamental Theorem of Calculus
- F. Mean-Value Theorem
- G. Indefinite
- H. Integration by substitution
- I. Numerical

- V. Applications of Integrals
  - A. Logarithmic and trigonometric functions
  - B. Bases other than “e”

**COURSE LEARNING OUTCOMES AND COMPETENCIES**

Upon successful completion of this course, the student will:

- A. Use Limits, including the evaluation of limits, use of limits, and the limiting process.
  - 1. Use the definition of a limit to verify a value for the limit of a function.
  - 2. Evaluate the limit of a function at a point both algebraically and graphically
  - 3. Evaluate the limit of a function at infinity both algebraically and graphically
  - 4. Use the limit to determine the continuity of a function.
  - 5. Apply the Intermediate-Value Theorem
  - 6. Use the limit to determine differentiability of a function.
  - 7. Use the limiting process to find the derivative of a function.
- B. Find Derivatives
  - 8. Find derivatives involving powers, exponents, and sums.
  - 9. Find derivatives involving products and quotients.
  - 10. Find derivatives involving the chain rule.
  - 11. Find derivatives involving exponential, logarithmic, and trigonometric functions.
  - 12. Find derivatives involving implicit differentiation.
- C. Use Derivatives, including curve sketching and applications of derivatives.
  - 13. Use the first derivative to find critical points.
  - 14. Apply the Mean-Value Theorem for derivatives.
  - 15. Determine the behavior of a function using the first derivative.
  - 16. Use the second derivative to find inflection points.
  - 17. Determine the concavity of a function using the second derivative.
  - 18. Sketch the graph of the function using information gathered from the first and second derivatives.
  - 19. Interpret graphs of functions.
  - 20. Use the derivative to find velocity, acceleration, and other rates of change.
  - 21. Use the derivative to find the equation of a line tangent to a curve at a given point.

22. Use optimization techniques in areas such as economics, the life sciences, the physical sciences, and geometry.
23. Solve related rates problems.
24. Use Newton's Method.
25. Use differentials to estimate change.

D. Find Integrals

26. Find area using Riemann sums and integrals.
27. Express the limit of a Riemann sum as a definite integral.
28. Evaluate the definite integral using geometry.
29. Integrate algebraic, exponential, and trigonometric functions.
30. Evaluate definite integrals using the Fundamental Theorem of Calculus.
31. Apply the Mean-Value Theorem for integrals.
32. Integrate indefinite integrals.
33. Integrate using substitution.

### **ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES**

Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

### **COLLEGE POLICIES AND PROCEDURES**

*Student Handbook*

<https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf>

*College Catalog*

<https://www.kckcc.edu/academics/catalog/index.html>

*College Policies and Statements*

<https://www.kckcc.edu/about/policies-statements/index.html>

*Accessibility and Accommodations*

<https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html>.